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Winter Landings at Night

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BRIEFS

KNOCKABOUT NO-NO. A southwestern Virginia Civil Air Patrol rescue coordinator received very definitive coordinates from the ELT-monitoring satellites that an emergency signal was being transmitted from the town of Roanoke. He quickly organized a search party of 15, who struck out in cars and on foot with hand-held direction finders. The active ELT was located in a closet in a private home. Because the owner did not disconnect the battery from the transmitter, he had instigated a costly, time-consuming search that could have delayed efforts to assist some pilot in real distress.

WHICH SWITCH? Some older aircraft have gear and flap activator switches that look alike and are situated near each other. Such look-alikes have been a continuing cause of accidents over the years. A pilot, eyes glued to the runway, reaches for and flips a switch that he thinks will retract the flaps after landing, but flips the gear-up switch instead. Commercially sold covers which enable the gear switch to be easily identified by touch alone are now produced under supplemental type certificates for certain aircraft. Consult your mechanic or local FAA office for information on approved covers. They must be installed by a qualified mechanic.

SOUNDS OF SILENCE. For the first time FAA is providing direct relief from aircraft noise to private citizens. The agency has provided money for soundproofing 100 homes and two schools near San Francisco International Airport. The project will cost around $880,000, of which FAA will pay 80% from its Airport Improvement Program.

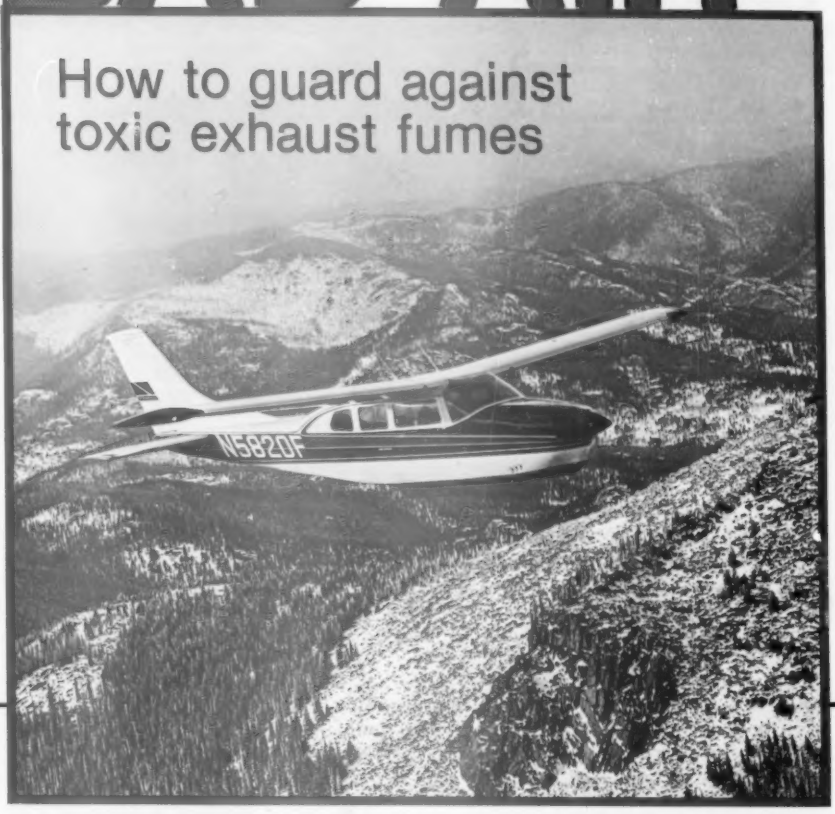
INFLIGHT WEATHER. Just a reminder that the test project "Hazardous Inflight Weather Advisory Service" (HIWAS) in FAA's Southern Region is still being evaluated. Over selected regional VOR's pilots can hear a continuous broadcast of hazardous weather conditions, e.g., SIGMETs, convective SIGMETs, and urgent PIREPs. This is a trial departure from the practice of broadcasting such information from centers and FSSs. Pilots using HIWAS are urged to send comments to FAA Southern Region, ASO-500, P. O. Box 20636, Atlanta, GA, 30320. For a listing of participating VORs, consult Class II NOTAMs or your nearest FSS.

BAD AIR

How to guard against toxic exhaust fumes

Soon after taking off, with the cabin heat full on to ward off winter chill at altitude, he began to feel a little sluggish, with a tightness across his forehead and the beginnings of a headache. He hoped it was just tension, the aftermath of a tough day at the office, and not the onset of flu or anything like that which could interfere with his planned skiing weekend in the Adirondacks.

Presently he began to feel warm and flushed, so he cut back on the heater, although he noticed the OAT read minus 20°F. A tingling sensation in his fingertips was mildly annoying. What really bothered him now was the headache and the way the engine noise was ringing in his ears. Something was not quite right, he realized, and he stared at the instrument panel—but the numbers and pointers danced away from his eyes. What the Devil . . . ? Sick, he felt sick. Must radio for help. *But the transmitter slipped from his numb fingers and fell to the floor. He lacked the strength of will to fumble for it, and allowed his body to slump back in the seat, closing his eyes for a moment, just one moment . . . . Mercifully he lost consciousness before the plane struck the ground.*



Is this unhappy scenario the introduction to some science fiction novel wherein man is attacked by vicious mind parasites? No, it is merely an all too typical description of inflight carbon monoxide poisoning. Unfortunately this deadly gas is able to take advantage of a pilot's reluctance to discontinue a flight, once airborne, and his willingness to rationalize away the telltale symptoms of CO in the cabin. Unless recognition and appropriate action take place immediately, the judgemental center of the brain ceases to function and fatal consequences are inevitable.

The most likely victim is the pilot flying alone, or out of sight of his passengers, so that no one else is able to bring the gravity of the situation to his attention while there is still time to act.

Although only a few accidents each year are officially attributed directly to carbon monoxide poisoning, they are virtually always fatal. It is impossible to tell how many more serious accidents or near-accidents have been caused by this colorless, odorless gas, because toxicological studies are not routinely carried out in the absence of fatalities. Even if this could be done, in suspicious circumstances, the evidence would not necessarily be conclusive. The National Transportation Safety Board, which is responsible for investigating all aircraft accidents in the United States, will only consider CO as a probable cause if the CO level is clearly more significant than any of the other possibly contributing factors.

This is because "natural" or environmental factors are often responsible for significant carbon monoxide concentrations in the bloodstream. A heavy smoker, for example, could have a CO level of from four to ten percent. Also, victims of a post-crash fire could have inhaled considerable CO before expiring—and in the case of crew members it might be impossible to tell whether the gas was inhaled prior to or after the crash. In any event, individual reactions to toxic gasses vary, so that it would be very difficult to determine what percentage of CO in the blood would impair judgement of a given pilot to the extent that it led to mismanagement of an aircraft and a crash landing.

How does this deadly gas get into the cabin? Quite simply, through the warm air duct. Aircraft do not have water-cooled engines, so unlike automobiles they are not heated by hot water heat exchangers. The cabins of most light aircraft are heated by passing outside air through a "muff" or "shroud" surrounding a segment of the exhaust pipe. Heat from the exhaust pipe is radiated to the intake air, which then is ducted into the cabin. It is a simple, economical system that works very well most of the time.

However, exhaust pipes tend to deteriorate under the stress of high temperatures (over 1,000°F.) and corrosive fumes from the burnt gasses of the combustion chambers. Although the component has no life limit, it does break down eventually and develops cracks or holes. Exhaust gasses from a rich fuel-air mixture of Avgas will contain about 7% carbon monoxide.

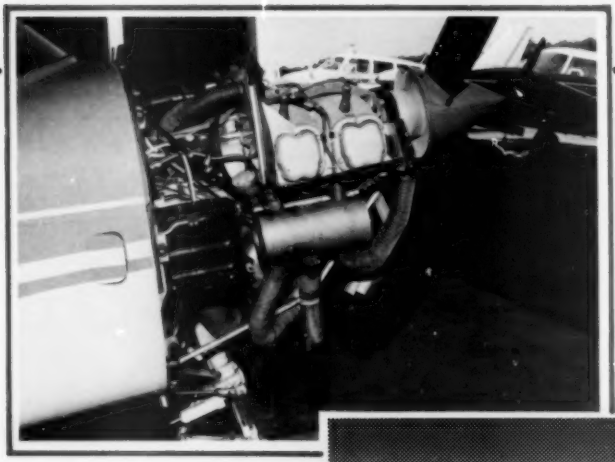
Seven percent may not sound like a lethal dose, unless you understand the high affinity of CO for hemoglobin, the oxygen fixing agent of the bloodstream. The CO molecule is about *200 times as attractive to hemoglobin as the oxygen molecule*. Therefore, even if carbon monoxide is present in the aircraft cabin in relatively small amounts it is possible for a pilot's blood to become CO-saturated. As little as one part of CO per 20,000 parts of air is considered hazardous enough to begin the onset of oxygen starvation and the progressive death of brain cells. (Since pilots who are smokers already have a four to ten percent CO saturation of their

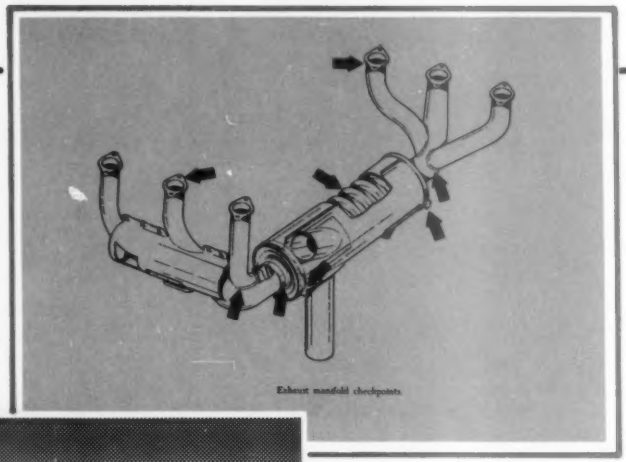
hemoglobin, they would ordinarily succumb to CO leakage sooner than others.) *Any* amount of carbon monoxide leakage into the cabin air is dangerous.

Furthermore, consecutive recurrent exposures to CO, as might occur during a multi-leg flight in an aircraft with a defective heating system, can also be dangerous, because the CO/hemoglobin fixation is cumulative unless the bloodstream has an opportunity for thorough cleansing before a repeated exposure.

Defects in the exhaust system that can permit CO introduction to the cabin heating system are most often found and repaired during required inspections, either when the mechanic visually spots breaks, cracks, pits, or dents in the exhaust piping; or when he actually removes the exhaust system and subjects it to an underwater/air pressure test. Such tests are *not mandatory, and will only be performed when the mechanic has reason to become suspicious of the exhaust pipe integrity—or if the owner insists upon the test.*

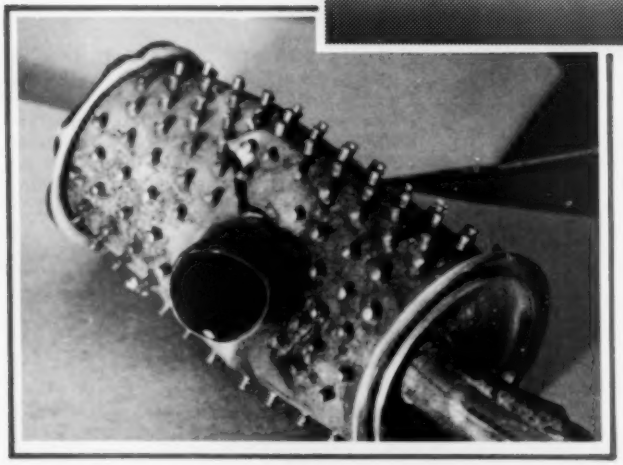
There are no life limitations on exhaust systems, i.e., they do not have to be replaced after a certain number of hours of operation like some engine parts. Their durability depends upon the kind of usage given the airplane, the design of the exhaust system, the climate, etc. In addition to heat and corrosion stress, the ex-

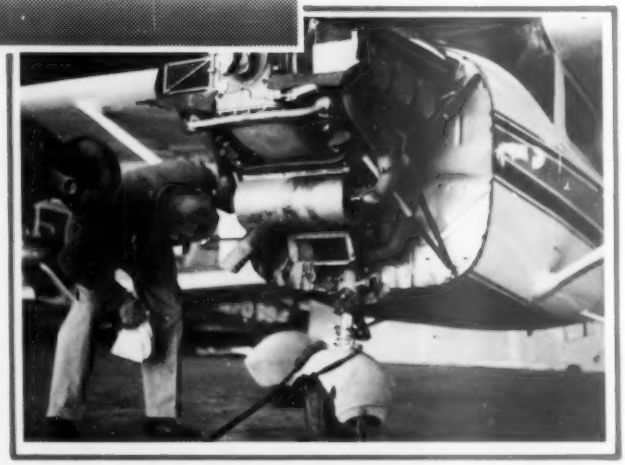




Exhaust manifold checkpoints

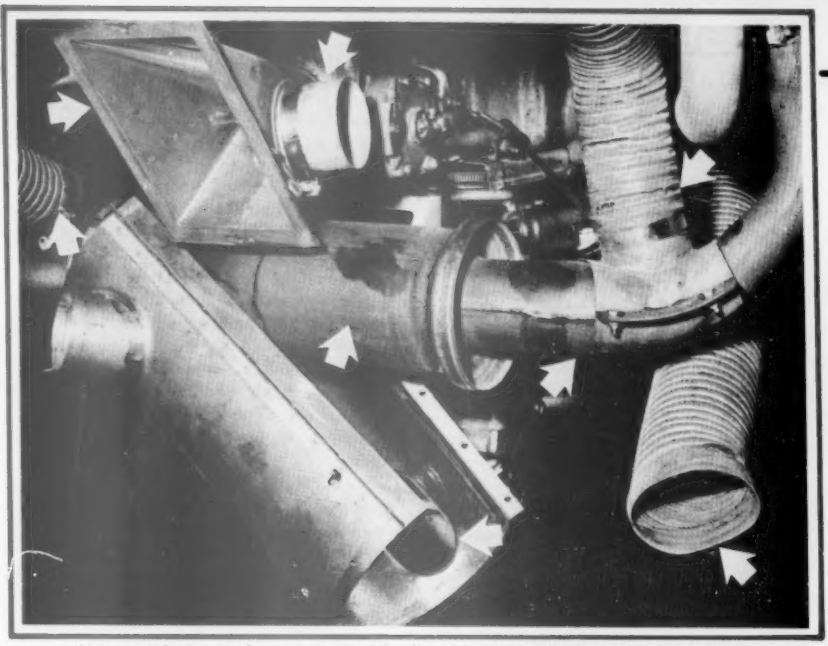
Exhaust systems are not easy to inspect. Most typical general aviation systems enclose the exhaust muffler (*lower left*) in a shroud or "muff" and pass intake air for cabin heating through the muff (*upper right, lower right*). Metal failure at muffler attach points and baffles (arrows) may not be visible without removal of muff. Even tiny cracks in muffler can allow enough CO to leak into heat exchanger and overcome cabin occupants.





EXHAUST PIPE CONTAMINANTS

Galvanized or zinc-plated tools should never be used on the exhaust system, and exhaust system parts should never be marked with a lead pencil. The lead zinc, or galvanized mark is absorbed by the metal of the exhaust system when heated, creating a distinct change in its molecular structure. This change softens the metal in the area of the mark, causing cracks and eventual failure.

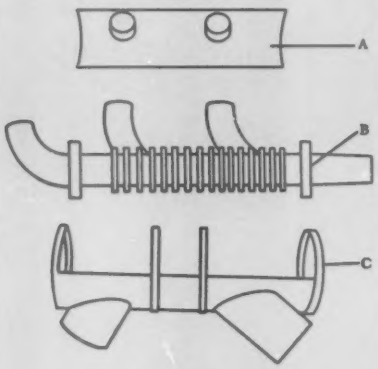


Heat exchanger shroud removed, showing most likely areas for failure.

haust pipe is subjected to continuous vibration, which eventually leads to metal fatigue and leakage. Exhaust system failures occur most often between the first 100-200 hours of aircraft operating time. More than 50% of these failures occur within the first 400 hours. Most aircraft manufacturers recommend that exhaust systems be checked after every 25 hours of operating time.

Joints and necessary bends in the piping are the system's weakest points, where vibration, dampness, and heat can do the most damage to the metal. Engine time is not necessarily a criterion of exhaust system health. Aircraft that have not been flown for a while are particularly susceptible to exhaust metal corrosion from humidity.

Even though most modern aircraft now use high grade stainless steel in the exhaust system to reduce corrosion, wear and tear will eventually take its toll. However, stainless steel failure rates are considerably lower than that of other metals used in exhaust systems (aluminum, galvanized steel), and owners of older aircraft may wish to consider a retrofit.



A. Upper sheet jacket.
B. Heat exchanger collector tube.
C. Lower sheet jacket.

Exploded View of Heater Exhaust Shroud Assembly

Once cracks or holes begin to appear in the exhaust pipe it is usually best to replace the entire system. Welds are never as strong as a single, solid piece and care must be taken to use welding rods compatible with the metal the exhaust system is made of. Excessive exhaust noise is often an indication of metal breakdown, requiring a stem-to-stern inspection of the entire system.

Although carbon monoxide is described as colorless and odorless, in the exhaust manifold it is often combined with pungent or acrid gasses. If you see or smell any smoky substances in the cabin during engine operation (with or without the use of cabin heat) you should suspect exhaust leakage. (Significant amounts of CO leaking through the firewall are also dangerous.) At the first sign of possible leakage, or onset of the previously described symptoms, follow these procedures to assure your safety:

1. *Immediately* shut off cabin heat and close off any other openings to the engine.
2. Open outside air vents at once (if unpressurized). Some pilots make it a practice to have air vents slightly open whenever they use cabin heat.
3. Do not smoke and do not allow anyone else to.
4. Use oxygen if you have it.
5. Descend as rapidly as safety and air traffic separation permits.
6. Land as soon as possible, and do not take off again until the exhaust system has been thoroughly inspected by a mechanic holding an airframe certificate—and well after all your symptoms are gone.

There are a number of commercially available CO detectors that can be installed in the cockpit, and many pilots use them for added security. They range from sophisticated electronic devices, costing up to $100, that beep or flash lights when they sense certain levels of carbon monoxide, to $2.00 "throwaway" detectors with a chemically treated spot on a plastic card that turns black in the presence of CO. Each of these devices has its advantages and drawbacks, and all add to panel clutter. The audible warnings are not always loud enough to catch the pilot's attention—especially in a cockpit that already has various noise-making warning systems. The visual-only warnings may not be noticed without special pilot monitoring, which adds to workload. The inexpensive spot detectors have to be replaced frequently because they eventually do turn black with exposure to normal air or cigarette smoke. Ideally, a CO detector should detect low levels of CO; should alert the pilot before it becomes lethal; should not give false alarms (some do in the presence of cigarette smoke); and should not require excessive pilot monitoring or frequent replacement. However, almost any type of automatic warning device is probably better than nothing.

On the other hand, some pilots feel that the most serious objection to a CO alert device is that it could lull the pilot into a state of unwarranted complacency and dependence, so that he neglects his responsibilities as regards maintenance on the ground and alertness in the air.

That is when he becomes vulnerable. **Warning!** All engines have bad breath. ■

For further information on this subject see FAA Advisory Circular AC 20-32B available from DOT Publication Branch, M-494.3, Washington, DC 20590.

Winter Landings at Night

With snow on the ground,
"things are not always what they seem"

Winter always brings on a rash of landing accidents, particularly at night. This is due in part, of course, to reduced visibility as the days are short and precipitation turns to snow in many areas. Even in clear weather snow on the ground at airports can create unexpected problems, inasmuch as it changes the familiar appearance of the terrain, and the reference clues we come to depend upon.

For example, *brightness* is one of the visual clues we commonly use to judge distance at night. After sundown, when terrain reference is blurred or completely obliterated, the brightness of lights at an airport is one of the primary means by which we decide when to begin a final descent to the runway, when flying VFR or using a non-precision instrument landing system. We carry in memory a pretty good recollection of just how bright any given airport looks at night at the altitude and distance from touchdown where we normally begin this descent.

However, such clues can be misleading if we fail to take into consideration factors which intensify the lighting—such as a snow cover on the ground. Crisp, glittering snow can increase airport luminosity by as much as 50 percent. This can lead a pilot to assume he is much closer to the airport than he actually is, so that he initiates his final descent too early, or establishes too sharp a glide angle. This sometimes results in an undershoot and possibly a landing short of the runway—or the pilot may add too much power when he recognizes his error and end up touching down far beyond the threshold.

The clear, clean air often encountered in winter enhances the illusion of being closer to the airport than in fact you are. There is a temptation to rely on what you see, and disregard the altitude and distance instruments. Occasionally pilots will become so dependent upon runway light brightness as a glide path clue that they will even ignore VASI lights, or respond to them improperly. Incidentally, the usefulness of non-standard unlighted glide slope indicators is questionable when snow piles up around them. These are often made up simply of boards set in the ground, and depend on reflectors or reflecting paint for aircraft guidance. Such reflections can be distorted by the snow.

Under some winter snow conditions the airport illumination may be *less than expected*—either because of weather conditions, such as low fog, or because of the type of lighting system in use. In contrast to large airports, small landing fields usually have only low intensity lights. This might lead the unwary pilot, who has not checked the Airport/Facility Directory in planning his flight, to form the impression from ground references on his approach that he is higher and farther out than he actually is. As a result he might touch down long, and at excessive speed. Given the questionable braking available on snowy or icy runways, landing well beyond the threshold may have even more serious consequences than an undershoot.

An accident of this nature occurred recently in the southern highlands of Virginia. The pilot of a Piper PA-28 *Cherokee*, with his wife and daughter aboard, had departed Wilmington, DE at 7:00 P.M. on February 14, 1981, bound for Abingdon, VA. During their 2½ hour flight the sky was clear, with visibility better than 15 miles. Their destination was Virginia Highlands Airport in the Blue Ridge Mountains (approximately 30 miles northeast of Bristol, TN). The airport was unattended at night but was illuminated with low intensity runway edge lights. They lined up for Runway 24, 2,890 feet long, at an elevation of 2,060 feet. There was compacted snow on the runway and the temperature was close to the freezing mark.

WHEN THE LIGHTS GO OUT

If the runway or other airport lights start to disappear during your approach to land, it is safest to assume this indicates not that the lights have been turned off or there has been an electrical failure but that they are being marked out by intervening terrain—i.e., you are in imminent danger of a collision with the ground. Climb immediately and break off the approach until you can re-establish a clear view of the airport.

In his statement later to the National Transportation Safety Board, the pilot said that during landing ". . . I was a little hot and a little long." He said that there was no braking action available and that he could see no runway end lights. The aircraft slid past the end of the runway, skidded down a steep embankment and finally came to a stop inverted. The pilot's wife received serious injuries and there was extensive damage to the airframe.

During a safety investigation carried out by the local Flight Standards District Office the next day, it was determined that all but one of the run-

Pilots preparing to land or takeoff in snow country or ski areas should take a careful look at the runway and landmarks.

High snow walls on either side can obliterate familiar guidelines and lead to "whiteout" and loss of directional control.

way departure end lights were functioning, but these were not the recommended type of light which shows red in one direction and green in the other but simply green lights which may have confused the pilot. Furthermore, five out of the six threshold lights were out. The VASI was a non-standard "bar VASI," a simple set of non-illuminated boards. The runway was somewhat narrower than standard 40 feet. In view of the missing threshold lights this could have given the runway an appearance of being much longer than 2,980 feet. Any or all of these factors could have contributed to the pilot's failure to judge distance and groundspeed correctly, as indicated in the Safety Board's determination of probable cause. (Virginia Highlands Airport is now in the process of modernization, which includes replacement of non-standard landing aides.)

Such miscalculations are possible even when executing a landing with the aid of an instrument landing system—if the aircraft breaks into the clear in an early stage of the descent and the pilot incorrectly interprets the illumination intensity on the snow-covered ground.

An unfortunate example of this type of accident occurred at Brainard, MI on January 9, 1983, involving a Convair 580 (small air carrier) flight. According to the National Transportation Safety Board, the Convair crew did not realize that when the runway approach lights were dimmed by radio control in this (non-standard) system, the runway edge lights were also dimmed. The Board noted that ". . . the dimming of the lights could have made the runway seem farther away, creating the illusion that the airplane was higher than it actually was. Thus the captain may have landed before he expected to, and he may have thought he had more time to align the airplane with the runway."

The Safety Board's investigation disclosed that just prior to touchdown, as the pilot attempted to position the twin turboprop over the center of the slippery, snow covered runway, he overcorrected and swerved to the right, striking a snowbank with the right wing. The right engine propeller broke off and slashed through the cabin, killing one passenger and injuring a second. The Board noted that the presence of high snow mounds along the runway blocked out some runway lights from the flight crew's line of sight, and that peripheral reference may have been lost in the snowy environment.

Mounded or drifted snow alongside the runway—often an inevitable consequence of runway plowing—is always a potential hazard to aircraft operation at night. At altitude the pilot of an approaching aircraft may be able to see the runway edge lights clearly, only to find them hidden by the piled-up snow after he touches down. If the centerline is also obscured by snow or ice frozen to the pavement, the pilot may have a great deal of difficulty with directional control of the aircraft on the ground.

This applies as well to departing aircraft. The pilot may feel that he can see the lights over the snow adequately as he taxies out, but once his aircraft accelerates on the takeoff run he may see nothing but a blur. He may in fact experience what is known as a whiteout, a condition in which all visual detail is absorbed by snow reflection.

Typically such accidents take place when there is an extensive cover of snow on the ground, perhaps a light layer on the runway, and piles or mounds of snow partially obscuring the runway edge lights. As he approaches to land the pilot has a good sense of ground reference to the runway, the edge lights and the perimeter of snow; but once down on the runway the flickering of lights through the snow makes it impossible for him to sustain this reference. He becomes disoriented and veers off course or ground-loops the aircraft.

Disorientation on the ground is one of those strange phenomena that has to be experienced in order to be believed; it afflicts seasoned pilots as well as novices. For example, the Piper *Seneca* twin that took off from Youngstown, OH Municipal Airport in a light snowfall on the evening of December 12 was flown by a pilot with a commercial certificate and over 2,500 hours of flight time to his credit. He had filed IFR and anticipated no difficulty for the short flight to Flint, MI. Although there was snow on the pavement he could see the centerline clearly and intended to use it as his principal reference for direction on takeoff, since the edge lights were partially obscured.

His plan worked well enough until at one point during the ground run the pilot glanced down at the instrument panel to check the manifold pressure reading. When he looked back at the centerline he found it was no longer visible. According to his statement to Safety Board investi-

Visual illusions can be heightened at night with snow on the ground. For example diagrams (1), (2), and (3), upper left, all refer to a runway of the same length, as seen from the cockpit at the same altitude and distance from the threshold. However, (2) which is narrower than the others seems longer, and (3) which is wider seems shorter.

Figures (4) and (5) are also the same length, but may appear otherwise to the pilot who does not consider the effect of terrain slope and adjust his altitude accordingly.

Figure 1
3° approach angle
Runway: 4000' x 100'
1600' from threshold
Altitude 105'

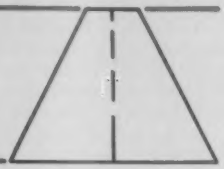


Figure 2
3° approach angle
4000' x 50' runway
1600' from threshold
Altitude 105'

Figure 3
3° approach angle
4000' x 150' runway
1600' from threshold
Altitude 105'

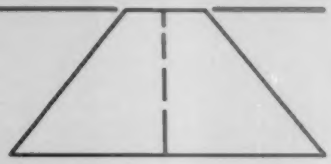


Figure 4
3° approach angle
4000' x 100' runway
+2° runway upslope
1600' from threshold
Altitude 105'

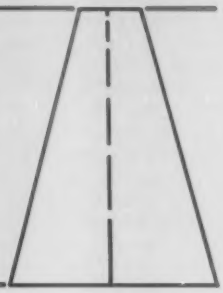


Figure 5
3° approach angle
4000' x 100' runway
−2° runway downslope

Similarly, snow obliteration of runway edge marking may extend its apparent width, and hence make it seem shorter than it is to the pilot who is landing at night.

On the other hand, snow mounds encroaching on the runway edges and apparently reducing its width can make it seem longer than it is. A belated touchdown plus poor braking conditions could lead to an overshoot.

gators, he ". . . looked quickly for the runway lights to my left, intending to parallel them but I could see nothing but darkness. At that time I didn't realize I was crossing the intersection between Runways 32 and 23 and that was the reason for no runway lights to my left . . . At that instant my nosewheel left the pavement . . . I saw lights close in front of me. This was the first time I realized I had deviated from the centerline. . . ."

Shortly afterwards, the left wingtip struck a distance marker off the runway, the nosegear impacted the ground and collapsed and the aircraft came to a halt. The pilot, the only person on board, was not injured. But damage was considerable.

The problem of ground reference is simplified for pilots if runways can be kept clear of snow by frequent brooming or blowing—admittedly not a easy matter during periods of heavy accumulation and busy traffic.

Unlike new fallen snow, compacted snow and ice cannot be removed by mechanical means. The porosity of the pavement surface allows snowmelt to enter and freeze, forming a bond which is nearly as strong as the pavement itself. Efforts to remove such ice by heavy machinery, after it has been compacted by aircraft, could damage the pavement.

Consequently pilots will often encounter ridges of hard packed snow or ice on runways, frequently obliterating the centerline where traffic is heaviest. This leads to poor braking action and sometimes loss of directional control—as well as possible damage to landing gear if excessive speed prevails.

The approved means of chemical ice control at airports employs either granular (usually Urea) spreading devices, or fluid distribution (usually a combination of Urea and Glycol). In any case, the chemical melting will result in deposits of slush and water, together with any remaining ice. Unless the runway is then broomed and cleaned, very slippery conditions will remain.

When drifts or mounds of snow accumulate around runways, they may interfere with ground reference for landing pilots not only by blocking out edge lights but also by altering the apparent shape and size of the runway and associated landmarks. Familiar trees or poles, for example, that are "dwarfed" by snow piled around them may give the pilot false clues (as regards distance to touchdown). Snow mounds alongside the cleared runway also tend to reduce, or in some cases to increase, its apparent width. These illusions can hamper the pilot in setting up his final approach (see "Landing Images", *FAA General Aviation News*, Sept./Oct. 1981).

Runways that have a pronounced slope, or low point, or a ridge, often cause problems to pilots of landing aircraft. A snow cover on the runway can make these irregularities very difficult to see, especially at night. The pilot must carefully adjust his glide angle to intercept the critical (touchdown) portion of the runway, rather than to any more distant segment, even though the latter may be more prominently silhouetted by the snow and light configuration. If the pilot fails to carry a somewhat nose-high angle when touching down on an upslope he may find himself landing on the nosewheel. Conversely, if the slope is down and the nose is not lowered appropriately on final, the flare may be too high and the landing hard.

These are only a few of the tricks of visual imagery that lie in wait for the pilot who is not accustomed to night operations in snowy terrain. Snow has a way of re-contouring the earth's surface unpredictably. To avoid being victimized, pilots should read carefully the information about the destination airport contained in the FAA Airport/Facility Directory and check with the local flight service station for NOTAMs. (Some small airports shut down in midwinter, and accumulate runway obstacles as well as snow.) Take the trouble to visualize pertinent airport features in advance, and don't be dazzled by all that glitter.

As a final precaution, even though there may be no apparent traffic in the area and you are anxious to get down, do not settle for a straight-in approach. Use a standard pattern, look the airport over (especially if it is unattended) and make sure you are seeing what you expected from the diagrams and descriptions studied during preflight planning, rather than illusionary images reflected in the winter snow. ■

(Editor's note: Some of the ideas for this article were suggested by Dr. Warren DeHaan of Boulder, CO, a consultant on pilot vision and factors of visual perception. Further details on snow and ice removal at airports are found in the FAA Advisory Circular 150/5200-23, available from DOT Publications Branch, M-494.3, Washington, DC 20590.)

STATIC SPARKS

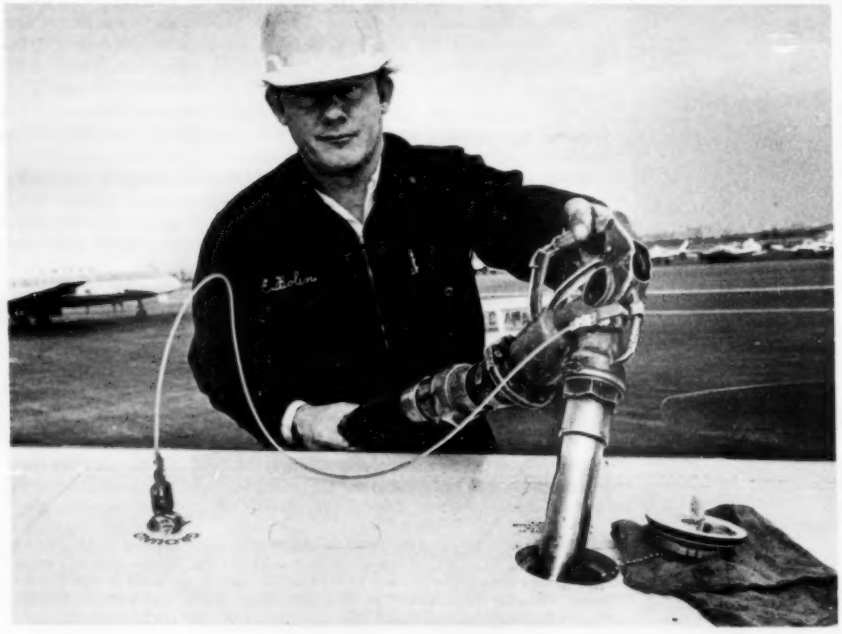
Most of the earth's surface is positively charged and most active aircraft become negatively charged. Fueling operations can provide an opportunity for electrical discharge, which may take the form of a spark. In the presence of volatile fuel vapors—BOOM!

Long before we had anything to do with airplanes we knew about static electricity as something that made clothes cling; that produced a jolt when we touched a metal doorknob after dragging our feet across a rug in a dry, heated room; that enabled a child's balloon to cling to a wall, and so on. Most of us have never been so unfortunate as to encounter this form of electricity as a spark which sets off a fueling fire in an aircraft, but if we have we know there is nothing funny or mild about it.

Static electricity, as we all know from our schoolbooks, is a buildup of charged particles or surplus electrons on a given substance after contact with another (unlike) substance. This commonly occurs to aircraft simply as a consequence of moving rapidly through the air. After landing, the surplus of electrons on the aircraft seeks a passage to the ground, which is blocked by the insulating properties of the air and the rubber tires.

However, when the metal surface of the aircraft is brought into close proximity with strongly grounded contacts during the fueling process, this gap may be bridged by means of an electrical spark. In the presence of fuel vapor that can turn the fueling operation into a fireball.

To prevent this hazard, approved fueling procedures require that the aircraft and the fuel supply tank or conveyance be properly grounded by means of metal cables before fueling begins. This is a vital precaution because the movement of fuel into the aircraft tends to concentrate the buildup of static electricity in this area. A solid and continuous contact between a metal nozzle and the lip of the receiving tank is also important to avoid sparking.



Dry, cold winters are the type of climate in which static electricity thrives. If there is much moisture in the air it tends to condense on the aircraft skin and to drain the static charges away fairly rapidly. Other things being equal, the higher the speed of an aircraft, the greater the accumulation of static; however, even powered ultralights are capable of a considerable buildup in dry, cold weather.

There are several other reasons why ultralights are susceptible to static sparking. For one thing, ultralights are largely composed of synthetic or plastic materials which are highly nonconductive, or capable of retaining a considerable electrical charge. For another, they are frequently fueled at off-airport sites where grounding devices may not be provided. Fueling may be carried out from a plastic jerry can which does not allow for metal-to-metal contact during the process and increases the chance of sparking. The use of chamois skins or plastic strainers increases the static charge. Ultralights also usually lack the "bonding" protection normally given certificated aircraft. This is a process of establishing a continuity of metal wiring from one section to another which "levels off" any static electrical buildup.

Operators of ultralights and certificated aircraft who fuel regularly in the field or the "bush" can protect themselves from danger by carrying their own grounding materials with them. A metal rod driven into the earth serves well as a grounding pole, and virtually any kind of metal cables with alligator clips will serve as connectors. Jumper cables are ideal.

Fasten one end of the cable to a solid, metal attach point on the aircraft or ultralight, and the other to the grounding pole. For additional safety you may also use a cable between the fuselage and the fueling container.

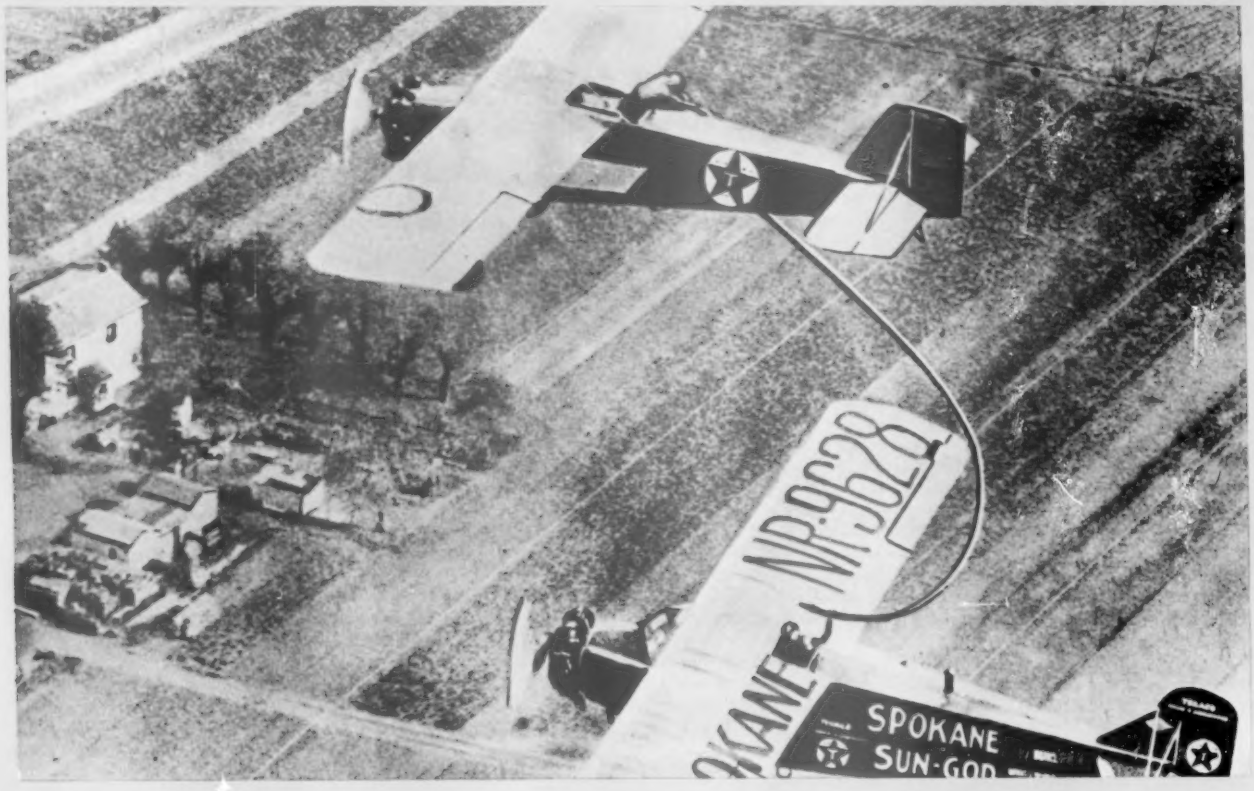
This may sound like a lot of unnecessary trouble and concern, but it will help make certain that the only charge you get out of flying is the satisfaction of a safe flight. ■

The Spokane Story

Nick Mamer's first nonstop round trip flight across the country.

Even in a zany year (1929) when flight records of every kind and in every direction were being set and immediately broken, the odyssey of the "Sun God"—back and forth across the continent nonstop with about 50 airborne fuelings—was memorable. It created no national heroes, nor did it enshrine any particular aircraft, but it did much to rescue a once famous city from obscurity and insure its future in the eye of aviation.

During this period of wildly expanding economy in the United States, many businessmen in Spokane, WA were concerned that the great wave of prosperity might pass them by, as it had in the past. In the early 19th century when the northwest territory was still a sprawling wilderness, Spokane had flourished as a Mecca for fur traders from as far away as San Francisco, Denver, and New York. Later, Spokane had thrived as the mining and lumbering center of the "Inland Empire," the vast, mountain-encircled high plateau land of eastern Washington and Oregon and western Idaho. But the same geographic features which had given this area its historic character also served to isolate it economically in the 20th century, as high overland shipping costs discouraged distant trade, and Spokane lagged behind the thriving cities of the coast. →



Crew lined up behind seven 50-gallon drums used to fuel "Sun God" for departure. Hometown crowd greets its return to Spokane.

However, in the late 1920's air commerce was promising to overcome the age-old barriers of time and distance as no other human invention had ever done, and Seattle was determined to win a place in the developing air carrier route system. All that was required was a local "Lucky" Lindbergh, a pioneering aviation hero who could capture the fancy of the press and the public with a record-breaking flight. The candidate chosen for this honor was Nick Mamer, a 30-year old ex-WW I fighter pilot who just happened to hail from the same central Minnesota grass roots countryside as the famous Lindy.

Nick Mamer fitted the pilot-hero mold as though he had been typecast by Hollywood's movie-makers: Tall, handsome, dark-haired and moustachioed. He had left the family farm at age 16 because of his fascination with aircraft and hung around in airports until he scrounged up enough money for flying lessons (at the Curtiss Flying School in San Diego). Nick won his military wings at Kelly Field, TX; and ultimately became one of the most decorated pilots in the celebrated U.S. Seventh Aero Squadron in France. He survived a glorious dogfight in which he alone took on three enemy Fokkers and was shot down in flames.

After the war Nick launched his own air charter service, and migrated eventually to Spokane to obtain a franchise with Buhl Aircraft. The recently marketed Buhl *Airsedan*, the creation of Michigan milkcan manufacturer Lawrence D. Buhl, was a sesquiplane—a biplane with a short stubby lower wing, which reputedly gave it the advantage of greater lift than a standard monoplane while retaining the improved speed, and maneuverablility of the latter. Buhl was as eager to publicize his new design as the citizens of Spokane were to promote their city; other backers quickly lined up to support the FIRST NONSTOP FLIGHT ACROSS THE COUNTRY BOTH WAYS!

For this attempt a new *Airsedan* was painted bright red and named the "Sun God," after an early Spokane Indian deity. A 200 gallon fuel tank was squeezed into the 28 foot fuselage, leaving room for only one person at the controls at a time (Nick was accompanied by Art Walker, a local pilot). Several five gallon milkcans were also provided as receptacles for air-to-air refueling. Maximum gross weight was 3,100 lbs. and power was supplied by a 300 hp Wright *Whirlwind* engine turning a metal, two-bladed propeller. Top speed was 120 mph, service ceiling 14,000 feet. Instrumentation was very basic, and radios were non-existent, partly for lack of space, and partly because voice communications were not yet permitted to aircraft. Nick would keep the newspapers and his assistants informed by means of weighted notes dropped at pre-arranged airports and would receive messages taped to the fuel hose.

On takeoff, the afternoon of August 15, 1929, Nick headed first for the Pacific rather than the Atlantic Ocean, dropping his little notes over Oregon and receiving, over San Francisco Bay, an official letter of greeting from Mayor Rolph of that city to his counterpart in New York, Jimmy Walker. Aerial refueling was carried out successfully over Oakland, Reno, Salt Lake City, Rock Springs, WY and Cheyenne, North Omaha, Des Moines, Cedar Rapids, Chicago, Cleveland, and New York City. At Rock Springs, near the Continental Divide, the "Sun God's " prop sliced about ten feet off the refueling hose during a night attempt, which soaked the "Sun God" and its crew in gasoline. Otherwise there were no problems. Over New York Nick had to drop notes asking directions to Roosevelt Field, where he arrived in time to enliven a crowd of 10,000 persons gathered to watch an air race and stunt program.

On the return trip they were plagued with storms and high winds that made aerial refueling difficult, and on one occasion over Miles City, MN when the fuel hose was unmanageable, they were delivered fuel in venerable milkcans, which banged against the *Airsedan's* cabin perilously before being captured.

Five days after starting they were back where they had started, completing a journey of 7,200 miles nonstop and beating the previous record set by the Graf Zeppelin by over 300 miles. Although neither pilot had taken more than a catnap during the flight they were in good spirits.

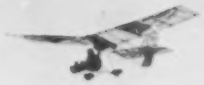
Over Spokane, after coping with a weary magneto and an ailing oil system, Nick was all for heading toward Seattle and perhaps repeating the circuit. All he asked for was soap and bathing water and a change of clothes—but all he received was canned goods, mostly beans, which he was tempted to pitch over the side. When an inexperienced fueling crew positioned the hose so that Nick had to look directly into the sun, with his fatigued, bloodshot eyes, he finally lost his temper and rained down a barrage of complaints.

After circling Felts Airport at Spokane for nearly six hours Nick and Art were finally allowed to land, to the wild applause of the crowd which had been assembled.

Although the feat brought national attention and a congratulatory wire from President Hoover, aeronautical prominence for Spokane was destined to wait. Within a few months the catastrophic Wall Street stock market slide of October 29, 1929 brought a halt to economic expansion throughout the nation. Buhl Aircraft was a quick casualty of the depression that followed.

Nick sold out his business to become an operations manager for Northwest, until his unfortunate death in an air crash in 1938, and Art Walker became a corporate pilot for a petroleum company. Neither man's name became a household word, but their accomplishment served its purpose. In time the major air carriers found their way to Spokane, and today that city averages 78 airline operations a day, with direct flights or connections to the Orient and Europe as well as the 50 states and Canada. The barriers to trade and travel have come down, perhaps in a large measure thanks to the venerable "Sun God." ■

Editor's note: This article was based in part on material taken from the book, "The Spokane Aviation Story," by Jim McGoldrick, and with the assistance of Thoville Smith, Spokane FAA District Office.)



Open Space vs Occupied Ground

The term "congested area" in regard to low level flight operations does not necessarily mean "heavily populated" to the FAA. Local law enforcement authorities may take a stringent view toward low flying in their community.

Aircraft stunts have been a popular diversion at outdoor gatherings for many years, and recently ultralights have joined the ranks of aerial entertainments. However, it is not very entertaining when the ultralight operator finds himself the recipient of a civil penalty (which can be as high as $1,000 for each offense) on the charge of flying over a congested area. In some cases there has obviously been a clear disregard of the Federal Aviation Regulations under which they operate (Part 103), which forbids flight over congested areas at any altitude.

On the other hand there may be some honest confusion over the meaning of the term "congested" as applied here. Originally a medical term meaning "an accumulation of blood," congested has recently become a well-used demographic term referring to accumulations, or even unexpected accumulations, of people. However, the actual number of persons required to imply congestion is not specified. Many pilots assume that a congested area as always a city or town or fair grounds or sporting area where hundreds of persons live or are temporarily massed.

That is simply not true. In upholding civil penalties assesses by FAA, the courts in various states have ruled that, in some cases, as few as three persons may constitute congestion. It all depends upon the conditions under which these persons are gathered together, and the potential threat of bodily harm from the vehicle in the air, be it ultralight or certificated aircraft.

Furthermore, violations of the rule may occur if overflights take place over areas like schoolgrounds or open air theaters during periods when they would normally expect to be populated—even if no one happens to be present at the time of the overflight.

For those seeking further definition of a congested area, perhaps the following words appearing in several NTSB decisions will be of interest: "Congested areas, while difficult to define in all applicable instances, are readily recognizable from the air because of the pilot's unique perspective from the cockpit." These words clearly place the responsibility for making a reasonable determination on the pilot.

In regard to rural areas there is also no cut and dried formula for determining how much open space between dwellings or other buildings implies *absence* of congestion. The operator of an ultralight, or an aircraft (under Part 91.79), must use his judgement in accordance with the intent of the applical rules. FARs 91 and 103 are designed to allow persons to operate various airborne vehicles for their own personal business or recreation, but only in a manner that protects innocent persons from harm or potential harm. (Local ordinances may further restrict flight activities.)

Take, for example a pilot who overflew a rural school near Moline, KS and landed (no emergency involved) on an unoccupied playground to visit some friends on a nearby farm. The pilot's certificate was subsequently suspended for violating FAR Part 91.79 (b). Why? Because a judge who ultimately heard the airman's appeal said the pilot should have realized that, given the time of year and hour of day, children and teachers would have been inside the schoolhouse *and likely to be outside at any time*. The pilot's action, when no inflight emergency was involved, subjected the people in the schoolhouse to an unnecessary risk; thus, the judgement went against him.

Certificated aircraft, flown by trained, tested and medically qualified persons, are permitted to fly over congested areas at an altitude of 1,000 feet or higher above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft [FAR 91.79 (b)]. The rationale of this rule is that given the known standards to which the aircraft and the pilot has been certificated, no harm is likely to come to persons on the ground in the event of an inflight emergency of any kind.

However no aircraft may be flown at any altitude in circumstances which do not permit, in the event of power failure, that an emergency can be made without undue hazard to persons or property on the ground.

Ultralights, operating under Part 103 on the other hand, are not permitted to overfly congested areas at *any* altitude, precisely because the vehicle is not bound by any design or construction standards, nor is the pilot necessarily trained, tested or medically qualified according to any official standards. The freedom from government controls or standards given to ultralight operations requires that a proportionally greater measure of protection be provided to innocent persons. ■

SAVING THE WHALES. "Lifeforce," a Vancouver, BC animal rights organization, is now using ultralights in an effort to stem illegal whaling activities, and capture of whales by aquaria. Two "Lifeforce" spotter pilots fly their ultralights daily over the waters of Vancouver's Pedder Bay, looking for whales in distress. They radio any likely problems to a companion boat which speeds to the rescue. The group plans to use the ultralights (because of low operational costs and low level flight capability) to monitor Canadian seal kills and conduct animal search and rescue.

NEW RADAR SERVICE AREA TESTED AT TWO AIRPORTS

Pilots operating in western Ohio and Texas are invited to help FAA evaluate a modification of airspace and air traffic services at medium density airports now undergoing a year-long field test at Columbus, OH and Austin, TX airports.

The new airspace designation, known as an Airport Radar Service Area (ARSA), is tentatively replacing the familiar TRSA, or Terminal Radar Service Area at these two airports. Whereas radar advisories and related VFR services are optional to pilots at TRSA's and subject to controller workload considerations, at Columbus and Austin the air traffic facility now assumes the responsibility for resolving all potential conflicts between IFR and VFR aircraft—the latter are required to maintain two-way radio communications in the ARSA and to accept radar traffic advisories and sequencing instructions for arrival.

The airspace affected is similar to, yet less complex than, the familiar "upside down wedding cake" configuration used at TRSA's, a circle with a radius of approximately five miles, from the ground up to 2,000 feet, and extending some additional five miles from 2,000 feet to 4,000 feet AGL. (The Special Federal Aviation Regulations establishing the tests requires pilots to check current NOTAMs for airspace designations for Austin and Columbus.)

Ultralight operations and parachute jumps are prohibited in this airspace without prior air traffic control authorization.

If the Airport Radar Service Area design is confirmed as a desirable alternative to the TRSA, present plans call for an eventual conversion of 138 TRSA terminals to ARSA's. Pilots are invited to send their comments to FAA, Office of the Chief Counsel, AGC-204, Docket no. 23708, 800 Independence Ave., S.W., Washington, DC, 20591. The evaluation period will end on December 22, 1984 at Austin; and on January 18, 1985 at Columbus.

GAR NO LONGER NEEDED

This past December 31, 1983 marked not only the end of a year but also the end of the General Aviation Reservation system. GAR was adopted in 1981 after some 11,000 air traffic controllers left their jobs. The system allotted pre-determined general aviation IFR slots on a first-come, first-serve basis once priority operators had filled their schedules. As the air traffic system was restored, the system became unnecessary, and phase-out began in the summer of 1982.

ADDITIONAL APPROVED SEATS

FAA has approved the use of more child restraint seats (in addition to those listed in Nov./Dec. 1983 issue of FAA GENERAL AVIATION NEWS) in general aviation and commercial aircraft. These are seats made by "Cosco" which have the following designations: 81 Safe-T-Shield; 83 Travel Hi-Lo; 178 Luxury Safe-T-Seat; 181 Luxury Safe-T-Shield; 183 and 283 Deluxe Travel Hi-Lo; 313 Safe & Easy; 323 and 423 Safe & Snug; 378 and 478 Safe-T-Mate; 383 and 483 Deluxe High Back Travel Hi-Lo; and 582 and 682 First Ride.

Those interested in purchasing approved seats should note that some may not carry an FAA "seal of approval" but all carry a label indicating conformance to all applicable Federal Motor Vehicle Safety Standards.

AN OLYMPIAN EFFORT

FAA is studying the need for some special regulations in the Los Angeles area in anticipation of heavy tourist air traffic for the 1984 Summer Olympics.

Under consideration are two airport reservation systems (one for scheduled commercial and airline aircraft, the other for unscheduled operations, such as business, charter, and private aircraft) that would disperse the traffic among seven southern California and Nevada airports: Los Angeles International, Burbank-Glendale-Pasadena, Long Beach Muni, Ontario International, San Diego International, Santa Ana, and Las Vegas International. Special requirements are also being considered for the airspace directly over the Olympic Area.

Details will be featured in the March/April 1984 issue of FAA GENERAL AVIATION NEWS.

SAFETY IMPROVES IN 1983

Preliminary accident statistics for 1983 show that all aspects of civil aviation improved their safety records, continuing a downward trend. In 1983 general aviation had 3,175 total accidents, down 219 from 1982; fatalities dropped from 1,164 to 1,041; and fatal accidents decreased by 47, from 603 to 556. Airlines had only three fatal accidents with 14 fatalities, and commuter and air taxis both showed a reduction in fatal accidents and fatalities.

The general aviation accident decline is associated with improved attendance at pilot safety seminars and greater participation in the FAA Pilot Proficiency Program.

LATEST AIRMAN PUBLICATIONS

Random RNAV Routes

Pilots with RNAV-equipped aircraft should be advised that a new random route service is in operation in the adjacent U.S. FAA Advisory Circular 90-82, "Random Area Navigation Routes," explains the new routes. Free from DOT Publications Branch, M-494.3, Washington, DC, 20590.

Designated Engineering Representatives

An updated directory of FAA-approved consultants, known as Designated Engineering Representatives, is available from DOT Publications Branch, M-494.3, Washington, DC 20590. Each of the consultants is listed by state and his or her consulting specialty is given. AC 123.29-IR, "Designated Engineering Representatives," is free.

Exiting Small Planes

Guidance for meeting regulations pertinent to the size and shape of emergency exits in small airplanes (less than 12,500 lbs.) is available in AC 23-807-1, "Emergency Exits in Small Airplanes." Free from DOT Publications Branch, address above.

• Not So Easy Rider?

I recently overheard a conversation about a check ride given at my airport that sent me to my rule book to see what regulations had been violated. To my surprise I could not find one to cover this situation, so could you help out? I'm sure this must be illegal.

A pilot, while taking a check ride in a high performance single engine aircraft, was carrying a passenger in the rear seat. The pilot was accompanied by a properly certificated flight instructor. The check ride included unusual attitudes.

So, is it legal to carry the passenger? And, given the unusual attitudes, were the pilot and flight instructor in violation of FAR 91.15(c) (Parachutes and Parachuting)?

Dennis Pinion
Morgan Hill, CA

There are no provisions in the FARs against carrying passengers during check rides. However, arrangements should be made among all parties beforehand to make sure it is agreeable.

Part 91.15(c) is more for aerobatic flight than for unusual attitudes used on check rides, i.e., ". . . unless each occupant of the aircraft is wearing an approved parachute, no pilot of a civil aircraft, carrying any person (other than a crewmember) may execute any intentional maneuver that exceeds (1) a bank of 60° relative to the horizon; or (2) a nose-up or nose-down attitude of 30° relative to the horizon."

Unusual attitudes are not *necessarily* aerobatic maneuvers, providing they do not exceed the parameters in FAR 91.15(c) and 91.71 (Acrobatic Flight). However, 91.15(d) does not require parachutes if the above mentioned maneuvers are included in a flight test for a pilot certificate or rating.

• More on Surviving

I thought your article "At Home in the Snow" (November/December 1983) was well done. Allow me to make a few corrections and suggestions.

1. Recent study has shown that ice—because it is such a rapid conductor of heat—should never be used as a support in shelters. Wood or plastic supporting material is far better.

2. The example of the "beached" pilot needs a little clarification: He spent four days—not one—on the island before he was rescued. Also, he cut grass for his insulation and energetically scavenged what he could from the environment. He found a plastic garbage bag and a foam rubber cushion that helped shelter him.

3. Patrick LaValla was not an instructor at the Air Force Survival Training School. He was SAR Coordinator in Washington State.

4. Cattail fuzz, which is commonly found in winter in most parts of the country, is an even better insulator than dead leaves or pine needles.

5. The earth interior never gets below 18°F, so burrowing into the ground makes an excellent shelter in below-zero temperatures. Follow the animals' example and make your "den" just slightly larger than body size for maximum conservation of even more body heat.

6. Finally, in addition to cotton and wool clothing, the more recently available insulating materials such as "fiberfill," "hollowfill," and "polypropylene" are lightweight but highly efficient in conserving body heat.

Keep up the good work!

Skip Stoffel
Wenatchee, WA

An enlarged version of the winter survival article, including Skip's changes and updates, is now available without charge as a reprint from FAA Accident Prevention Specialists.

• Concerned Airman

I found this picture in a photography magazine recently, and it caused me some concern. This is not exactly an approved modification, is it?

Name withheld

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFO-807, Washington, D.C. 20591.

You are absolutely correct. That camera is duct-taped on the wingtip of a Blannik glider with stereo speaker wire from the shutter to the cockpit along the leading edge. Considering how a thin layer of frost can disturb airflow over a wing, imagine what that wire could do to the aircraft's flight characteristics, including its stall speed and wing lift symmetry. Furthermore, the wire could break and become tangled in control surfaces.

FAA-certificated mechanics know the approved methods of attaching cameras to aircraft which require extreme knowledge of the subject. This is no task for the uninitiated.

• Heading or Course?

The KENT TWO standard instrument departure (SID) at Boeing Field in Seattle, WA is similar to many others where it states. "Fly runway heading . . ." This works fine in a no-wind condition, but flying the runway **course** *would seem much safer during a crosswind departure. Also, it would provide separation from VFR traffic on the parallel runway as well as separation from surrounding terrain and neighboring Jackson International air traffic. What do you recommend? Should I fly the localizer, which allows navigation along the runway course, in crosswind situations?*

William A. Taylor
Renton, WA

On a standard instrument departure, "runway heading" means whatever heading is required to make good the runway course. Fly the localizer only if the SID so instructs. Air traffic control will be expecting you to do just that.

• Unsafe Safety Pilot

To clarify a question: a short time ago my Airman's Medical certificate was revoked by the Federal Air Surgeon, due to cardiac blockage.

Recently a pilot called and asked me to fly in his aircraft with him, (he knew my CFII ran through February 1984), so he could make some instrument approaches and have hood time toward maintaining his instrument qualification.

I told him that to log instrument hood time, and to make hooded approaches, you needed a qualified pilot rated in the aircraft to act as safety pilot, or the time could not be logged and credited toward the six hours. Otherwise people could use anybody at all in the right seat—an unsafe condition at best. He argued that he just needed someone to look at the window, and a pilot wasn't at all required. I did not go—since I haven't even sat in an aircraft this year, and even with thousands of hours, it would not have helped him.

Could you please advise whether I was correct in my refusal?

Name withheld

Right on target. A safety pilot must be current and qualified for the aircraft.

INSTRUMENT CORNER

• Simulator Queries

I have a couple of questions about instrument time and simulators that I wish you could answer for me. First, does the FAA assume all simulator time is dual? FAR Parts 61.57, 61.129, and 61.155 legitimize the use of simulators in qualifying for certification but do not specify where to log that time—as dual or pilot in command. So, how do I log it?

Second, can an instrument rated pilot log for currency the time he spends in an approved simulator as sole operator (not receiving instruction from an appropriately rated flight or ground instructor)?

Raymond J. Drozs
Chicago, IL

To answer your first question, time spent in a simulator or ground trainer may be logged as "instrument flight time" but not as dual or pilot in command. It may be counted in your total time.

Affirmative to your second question. An approved instrument simulator may be used for three of the six hours required under Part 61.57(e), as well as for the required six approaches for instrument currency.

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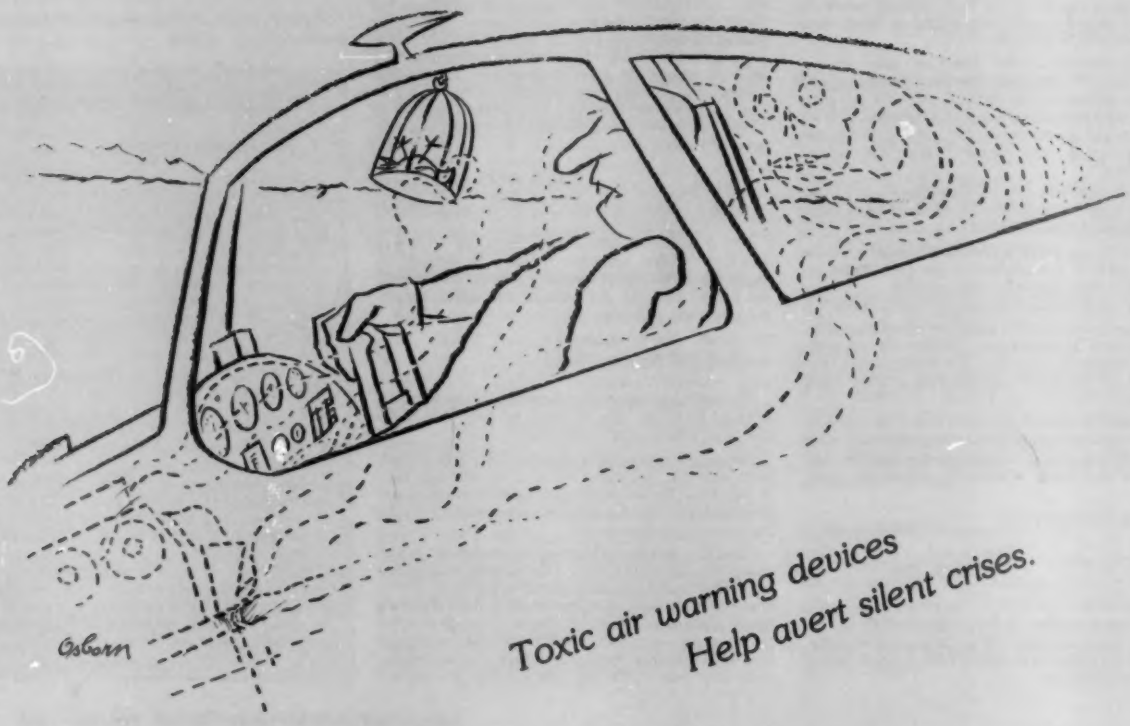

Toxic air warning devices
Help avert silent crises.